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(54) Title: CEMENTITIOUS COMPOSITIONS (57) Abstract Rapid setting cementitious compositions having great strength when applied thinly and exhibiting a variety of uses, particularly as a sealer of asphalt, and comprising cement, clay, fibers, sand, lime and an adhesive bonder. The amount of one or more of the elements present in the composition can be adjusted, thereby imparting properties which favor different applications, as well as facilitate employing the composition under different environmental conditions. Moreover, the nature of the composition is compatible with the incorporation of visually pleasing colored dyes.		

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CEMENTITIOUS COMPOSITIONS

BACKGROUND OF THE INVENTION

There exists various cementitious compositions,
5 particularly plaster, and concrete or mortar mixes made
therefrom. These substances are routinely used for a
variety of patching applications, including filling exposed
areas in airport runways, roadways, and the like.
Additionally, they are used to finish the exterior surfaces
10 of houses, roofs, as well as being favorably employed as
light weight floors, and decking.

Depending on the nature that a particular cementitious
composition is used for, it is often supplemented with
chemicals that permit the composition to be employed for
15 that particular application. Thus, plasticizing agents are
often included because they tend to increase the strength of
the cementitious composition, decrease the time it takes for
the composition to set, and further contribute other
desirable qualities. For instance, U.S. Patent No.
20 3,997,353 describes an early setting cement that neither
substantially expands nor shrinks when used in a variety of
purposes and contains calcium aluminate and calcium sulfate.

A key feature of any cementitious composition is its
strength. One means whereby cementitious compositions are
25 reinforced is to incorporate in them natural or synthetic
fibers. For example, U.S. Patent No. 4,199,366 describes
fiber reinforced cement-like material. Natural fibers such
as cellulose, cotton and silk are well known, and have been
widely used. Additionally, man-made fibers of polyamide,
30 polyester, and polypropylene have also been used.

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Generally, however, man-made fibers are better reinforcing agents when compared to their naturally occurring counterparts.

In addition to the fibers described above, adjuvants
5 such as cellulose waste, wood chips, and other fillers are frequently added to reinforce cementitious compositions. Also, glass fibers, polyvinyl alcohol fibers, or mixtures of these can be employed as reinforcing additives. However, these latter fibers are ideal in instances where a
10 significant degree of flexibility is sought in the final composition.

Additional elements found in cementitious compositions are an adhesive binder, sand, lime and clay. While silica sand is most convenient and inexpensive, a variety of
15 different types of sands composed of siliceous materials can often be utilized. Generally, the sand must be of a particular particle size which enables the composition to be employed for a particular task. Most cementitious compositions incorporate an amount of lime sufficient to
20 impart a degree of workability to the composition. Clay is further added to give the composition body, as well as to provide a surface for pigment absorption.

Despite the existence of numerous cementitious compositions, none of them exhibit high strength when
25 applied in a thin layer, set rapidly, are long lasting, and are capable of retaining added colored pigments. Further, none of the presently available cementitious compositions can be used both to cover asphalt surfaces, as well act as a filler for patching holes in roads, runways and the like.
30 Generally, if a cementitious composition has one or more

desirable properties, the composition is not rapid setting. Most cementitious compositions require weeks, if not months, to properly set.

5 **SUMMARY OF THE INVENTION**

 A cementitious composition having sealing and patching properties, particularly useful for sealing surfaces of asphalt, cement or the like, or patching highways, airport runways and similar surfaces. It is composed of an
10 adhesive bonder, vinyl acetate, a wood product, cement, clay, strengthening fibers, sand and lime, and water. Additionally, substances that facilitate application of the composition are included.

 The components of the composition coact to form a
15 resilient yet flexible material, particularly when applied as a thin layer, and have the appealing property of setting in as short a time as five minutes. Further advantages of the composition are that it is capable of pigment retention, thereby imparting to the composition a pleasing appearance.
20 Moreover, by varying the amount of one or more components that comprise the composition, particular applications are enhanced, as well as the ease with which it can be employed in different environmental settings.

25 **DETAILED DESCRIPTION OF THE INVENTION**

 The cementitious composition described herein is comprised of solids and liquids. These components can be kept separately, and combined prior to use to form the composition.

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Solids comprising the composition are cement, clay, sand, fibers, and lime. It should be noted that a variety of different types of cements can be utilized. This includes Portland cement, alumina cement, iron Portland cement, trass cement and blast furnace cement.

The second solid component, clay, acts as a moisture filler, imparting to the composition body, and, moreover, provides an adhesive surface, particularly for dyes, should they be added to color the composition. The third solid component, fibers, are responsible for a significant amount of the strength, and partial flexible nature of the composition. It is anticipated that a variety of synthetic or naturally occurring fibers can be utilized. Typical natural fibers are cellulose, cotton, and silk. Man-made fibers are polyamide, polyester, and polypropylene. Polypropylene fibers are particularly desirable because they impart a degree of strength and flexibility not found in the other fibers. Moreover, it is further desired that the polypropylene fibers should be approximately one-eighth to three-fourths inches long.

It should be noted that in addition to the above described fibers, it may also be possible to use glass fibers, particularly alkali-resistant glass fibers. However, because of the relatively high cost of these fibers, it is anticipated that they will not be routinely employed.

The fourth solid constituent, sand, primarily functions as an adhesive element, allowing for aggregation and setting of the cementitious composition when the latter is used to coat porous surfaces, roads, airport runways and the like. A variety of materials are usable under the term "sand."

While silica sand will most frequently be utilized because it is easy to obtain and inexpensive, other materials, silicas or non-silicas, may be favorably employed. Examples of non-silicas materials include, but are not limited to, fly ash, and volcanic glasses. If silica sand is utilized, it is preferred that it be 90 grit - 16 grit in size. This size distribution has been found to be particularly favorable for numerous applications of the cementitious composition. However, it should be noted that by varying the size of the sand particles, it may be possible to extend the uses of the composition to instances where it may coat, or act to fill holes in surfaces that can be similarly repaired with conventional cementitious compositions.

The final solid component is lime. It is anticipated that lime will be added to the composition for most uses; however, it should be noted that it may be omitted without affecting the overall properties of the composition. The function of lime is twofold; first, its interaction with the other components of the composition considerably increases the workability of the composition. And, second, it enhances the cover retention properties of the composition. In the former instance, for some applications, lime will not increase the workability of the composition because of its tendency to incorporate air.

The second category of components, or liquids, comprises an adhesive bonder, a wood product soil stabilizer, and optionally, a liquid additive for enhancing the fluid quality of the cementitious composition, thereby enabling it to be readily applied, particularly if the composition is pumped.

A variety of common bonders can be utilized in the cementitious composition. Most of these are sold under trade names well known to those in the art. Similarly, there exists a large number of liquid additives that facilitate
5 pumping the composition. A further benefit associated with the use of such additives is that they simultaneously act as low-foaming agents, and heat retardants. The former feature is particularly attractive in those instances where the composition is applied via pumping.

10 A number of liquid additives are shown in U.S. Patent No. 4,265,674. Additionally, a further liquid additive that performs satisfactorily is sold under the trade name of Vinyl Glaze, (Tibbetts Co., Santa Ana, California). Vinyl Glaze is predominantly vinyl acetate. It is particularly
15 desirable to add Vinyl Glaze in those instances where the cementitious composition is applied in warm climates.

The third liquid additive comprises a variety of what are known in the art as soil stabilizers. When added to the composition, they increase its strength and hardness.
20 Moreover, they considerably decrease the cure time of the composition for particular applications. Indeed, the cure time for patches is reduced from weeks to hours. Suitable soil stabilizers are sold under the trade names GP or GPS (Cold Bond Co.).

25 The solid and liquid components can be kept separate until just prior to use, whereupon they are combined in the presence of water and mixed, followed by the addition of further water. The mixture is stirred, agitated, or similarly treated to effect a homogeneous composition and
30 thereafter employed for a particular job.

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It is important to note that by varying the amounts of the various solids or liquids, it is possible to impart to the composition properties that favor its use for a particular application. However, for most uses the formulation will be about:

- 15 gallons bonder
- 15 gallons wood product (soil stabilizer)
- 500-600 lbs. cement
- 600-1000 lbs. sand
- 2 lbs. fiber
- 50 lbs. lime (optional)
- 10 gallons Vinyl Glaze additive (optional)
- water to 200 gallons

The composition can be applied using a variety of techniques, each of which will be suitable for a particular job application. Thus, it is anticipated that it will be either poured, pumped, or sprayed, depending on whether it is being used to fill holes, seal surfaces, or the like. Recall that the applicability of the composition is facilitated in particular weather environments by the addition of organic additives which aid in its fluid application. Thus, it is anticipated that chemicals sold under the trade name Vinyl Glaze will be added to the composition should it be pumped or sprayed. The latter additives can be added to the composition after the other components have already been prepared.

It will be further noted that by varying the amounts of either the powder or liquid components, the composition can be optimally suited for specific applications. For instance, if the composition is used to seal a relatively

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smooth asphalt surface, it can be applied about 1/64 of an inch thick. However, should the surface exhibit discontinuities, particularly pitting and the like, then proportionally more sand, or sand with different grit size
5 is anticipated to be favorably employed.

CLAIMS

1. A composition comprising about 15 gallons of
2 bonder, 15 gallons of a liquid wood product, 500-600 pounds
of cement, 600-1000 pounds of sand, 2 pounds fibers, and
4 water to make 200 gallons.
2. A composition as described in Claim 1 wherein
2 said liquid wood product is a soil stabilizer.
3. A composition as described in Claim 2 wherein
2 said cement is drawn from the group consisting of Portland
cement, alumina cement, iron Portland cement, trass cement,
4 and blast furnace cement.
4. A composition as described in Claim 3 wherein
2 said sand is 90-16 grit.
5. A composition as described in Claim 3 wherein
2 said sand is drawn from the group consisting of glass, and
trass.
6. A composition as described in Claim 3 wherein
2 said fibers are about 1/4 inch long and are composed of
materials drawn from the group consisting of polypropylene,
4 polyvinyl alcohol, polyvinyl acetate, and their polymers and
copolymers.

7. A composition as described in Claim 3 wherein
2 said fibers are about 1/4 inch long and are composed of
material drawn from the group consisting of glass,
4 cellulose, and cotton.

8. A composition as described in Claim 3 further
2 comprising 50 pounds of lime.

9. A composition as described in Claim 3 further
2 comprising about 10 gallons of vinyl acetate.

10. A composition comprising about 15 gallons bonder,
2 15 gallons of liquid wood product, 500-600 pounds of
Portland cement, 600-1000 pounds sand having 90-16 grit
4 size, 2 pounds of polypropylene fibers being about 1/4 inch
in length, 50 pounds lime, and water to make 200 gallons.

11. A composition comprising about 15 gallons bonder,
2 15 gallons of liquid wood product, 500-600 pounds of
Portland cement, 600-1000 pounds sand having 90-16 grit
4 size, 2 pounds of polypropylene fiber being about 1/4 inch
in length, 50 pounds lime, 10 gallons vinyl acetate, and
6 water to make 200 gallons.

12. A method of sealing surfaces by applying a
2 composition comprising 15 gallons bonder, 15 gallons liquid
wood product, 500-600 pounds cement, 600-1000 pounds of 90-
4 16 grit sand, 2 pounds of polypropylene fibers, 50 pounds
lime, and water to make 200 gallons.

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13. A method as described in Claim 12 further
2 comprising 10 gallons of vinyl acetate.

14. A method as described in Claim 13 wherein said
2 surface is an asphalt road.

15. A method of filling holes in an otherwise flat
2 surface comprising applying to said hole a composition
comprising 15 gallons bonder, 15 gallons liquid wood
4 product, 500-600 pounds cement, 600-1000 pounds of 90-16
grit sand, 2 pounds of polypropylene fibers, and water to
6 make 200 gallons.


16. A method as described in Claim 15 further
2 comprising 50 pounds of lime.

17. A method as described in Claim 16 further
2 comprising 10 gallons of vinyl acetate.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US87/00732

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
INT. CL. CO4B 14/00, 14/38, 16/02, 7/02		
U.S. CL. 106/76, 84, 89, 93, 97, 99		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S. 106/76, 84, 89, 93, 97, 99		
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁵
X	U.S., A, 4,065,319 (DESMARAIS) 27 December 1977. See columns 3 and 4.	1-17
X	U.S., A, 4,118,241 (BERNETT) 03 October 1978. See Table 1.	1-17
X	U.S., A, 3,963,507 (KURAMOTO ET AL) 15 June 1976. See column 4, lines 48-66.	1-17
X	JP, A, 58-190850 (SHINETSU CHEM. IND. KK) 07 November 1983. See Abstract.	1-17
Y	U.S., A, 4,040,851 (ZIEGLER) 09 August 1977. See Examples.	1-17
Y	DE, A, 2,304,478 (Mathis) 01 August 1974. See Abstract.	1-17
A	U.S., 4,240,840 (DOWNING ET AL) 23 December 1980.	1-17
A	U.S., A, 4,225,359 (SCHNEIDER) 30 September 1980.	1-17
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁵ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ³		Date of Mailing of this International Search Report ³
12 June 1987		25 JUN 1987
International Searching Authority ¹		Signature of Authorized Officer ²⁰
ISA/US		Ann Knab 

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ^{1*} with indication, where appropriate, of the relevant passages ^{1*}	Relevant to Claim No ^{1*}
A	U.S., H, T 948,009 (GREMINGER ET AL) 06 July 1976.	1-17

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